

The Office Action rejects claims 1-4, 6, 10-13, 16 and 20 under 35 U.S.C. §103(a) as unpatentable over JP 1-202898 in view of JP 5-327212; and claims 17-19 and 21 under 35 U.S.C. §103(a) as unpatentable over JP 1-202898 and JP 5-327212 and further in view of WO 94/29897. Applicants respectfully traverse the rejection.

Applicants respectfully submit that none of the applied references, in combination or alone, suggest or disclose a process for manufacturing a multilayer flexible wiring board comprising at least the steps of placing the metal wirings of two flexible wiring board pieces in close contact with each other at their surfaces and contacting the tip of an ultrasonic resonator with the exposed opposite side of a bonding portion of the metal wirings of at least one flexible wiring board piece of the two flexible wiring board pieces to be bonded and applying an ultrasonic wave to the ultrasonic resonator to bond the two metal wirings, as recited in amended claim 2.

In contrast to the claimed invention, JP 1-202898 instead discloses a process for manufacturing multilayer flexible wiring boards including the steps of laminating a substrate designated as Y axis pattern layer 10 and a substrate designated as X axis pattern layer 20 by connecting Y axis conductive material pattern 15 of Y axis pattern layer with X axis pattern layer 25 by thermo-compression bonding. Insulating films 16 and 17 provided on an opposite surface of Y axis pattern layer 10 and insulating films 26 and 27 provided on an opposite surface of X axis layer 25 are removed by pressing the position of the window 22 at the through hole 2 with thermo-compression bonding electrode 30. This feature directly contrasts with the claim language of claim 2 because the X axis pattern layer and Y axis pattern layers are not placed closely together and then bonded by applying ultrasonic wave. Furthermore, if the ultrasonic wave apparatus of JP 5-327212 is used in conjunction with the process of JP 1-202898, instead of thermo-compression electrode 30, it would be impossible

to electrically connect the Y axis pattern layer to the X axis pattern layer because the ultrasonic wave apparatus is not capable of melting the insulating layers to be removed.

Moreover, the combination of the applied references will not have resulted in the claimed invention because JP 5-327212 teaches a conductive part connected by solder bonding 3 so that the solder 3, such tin foil, is interposed between the printed wiring board 1a and 1b. This directly contrasts with the method of the claimed invention wherein metal wirings are connected in close contact with each other by application of an ultrasonic wave to the metal wirings. Therefore, in view of the foregoing distinctions, Applicants submit that claim 2 is patentable over the combination of applied references. Claims 3, 6, and 22 are also patentable over the combination of applied references for at least the same reasons as claim 2 and for the additional features recited therein.

Applicants submit that the combination of applied references fails to suggest or disclose a multilayer flexible wiring board that is formed by laminating it to at least two flexible wiring board pieces having a base film and a metal wiring provided on the base film, wherein at least one flexible wiring board piece has a cover film including a resin film on the metal wiring and a first opening is provided on the cover film, and said metal wiring exist at the bottom of the first openings so that the metal wirings of the flexible wiring board pieces are electrically bonded to each other by applying ultrasonic wave while the part of the metal wiring located at the bottom of the first opening is in close contact with the metal wiring of the other flexible wiring board piece, and further wherein the first opening and the metal wiring located at the bottom of the first opening form a concave and the part of the metal wiring of the other flexible wiring board piece to be bonded to the concave forms a convex on the base film, as recited in amended claim 10, and similarly recited in claim 12.

In contrast to the claimed invention, JP 1-202898 instead teaches that the metal wirings can be made in various ways. For example, it teaches that a second opening can be

designed on a lower portion of the board and form a concave structure (Fig. 1 #12). The Office Action alleges that because this is opposite to a convex structure that it would be a natural variation of the concave structure. Applicants respectfully disagree with this characterization of JP 1-202898.

Specifically, Applicants submit that it would be contradictory, rather than intuitive, to design a feature which is diametrically opposed to the teaching of the prior art. Applicants also note that there is no Fig. 6 in JP 1-202898. Applicants are uncertain whether Fig. 6 refers to the applied references or the claimed invention. Written clarification is respectfully requested.


In neither of the applied references, JP 1-202898 nor JP 5-327212, is there suggestion or disclosure that the first opening and the metal wire located at the bottom of the first opening form a concave and the part of the metal wiring of the other flexible wiring board piece to be bonded to the concave forms a convex on the base film. Therefore, to the extent that these features are not present in the applied references, Applicants respectfully submit that claims 10 and 12 are patentable over the combination of applied references. Claim 11 is also patentable over the combination of applied references for at least the same reasons as claims 10 and 12 and for the additional features recited therein.

The Office Action relies upon WO 94/29897 to supply the deficiencies of JP 1-202898 and JP 5-327212 with respect to claims 17-19 and 21. However, Applicants submit that WO 94/29897 fails to supply the deficiencies of the Japanese references with respect to independent claims 2 and 10 from which they depend. Therefore, Applicants respectfully request that rejection of claims 1-4, 6, 10-13 and 17-21 under 35 U.S.C. §103(a), be withdrawn.

In view of the foregoing amendments and remarks, Applicants submit that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 2-4, 6, 10-13 and 17-22 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number set forth below.

Respectfully submitted,



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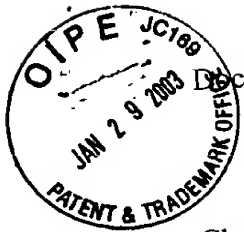
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Petition for Extension of Time
Appendix

Date: January 29, 2003

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DEPOSIT ACCOUNT USE AUTHORIZATION Please grant any extension necessary for entry; Charge any fee due to our Deposit Account No. 15-0461
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Docket No. 107594

Application No. 09/688,181

APPENDIX

Changes to Claims:

Claim 16 is canceled.

Claim 22 is added.

The following is a marked-up version of the amended claims:

2. (Twice Amended) A process for manufacturing a multilayer flexible wiring board by bonding metal wirings of at least two flexible wiring board pieces having a base film including a resin film and a metal wiring provided on said base film, ~~said process~~ comprising the steps of:

a) placing said metal wirings of said two flexible wiring board pieces in close contact with each other at their surfaces.

b) contacting the tip of an ultrasonic resonator with an exposed opposite side of a bonding portion to be bonded of said metal wirings of at least one flexible wiring board piece of two flexible wiring board pieces to be bonded; and

c) applying an ultrasonic wave to said ultrasonic resonator to bond said two metal wirings to be bonded.

3. (Twice Amended) The process according to claim 2, further comprising the steps of:

providing a thermoplastic resin layer on said at least one flexible wiring board piece to be exposed to the bonding portion of said metal wiring before performing step a).

and

adhering said two flexible wiring board pieces using said thermoplastic resin layer after performing step c).

~~wherein ultrasonic wave is applied to said metal wirings in close contact with each other at their surfaces while a thermoplastic resin layer developing adhesiveness upon heating is placed between said two metal wirings~~ are electrically bonded by the step c).

10. (Twice Amended) ~~The~~A multilayer flexible wiring board that is formed by laminating at least two flexible wiring board pieces having a base film and a metal wiring provided on said base film, wherein at least one flexible wiring board piece has a cover film including a resin film on said metal wiring and a first opening is provided on said cover film, and said metal wiring exists at the bottom of said first opening so that said metal wirings of said flexible wiring board pieces are electrically bonded to each other by applying ultrasonic wave while the part of said metal wiring located at the bottom of said first opening is in close contact with said metal wiring of the other flexible wiring board piece, and further wherein said first opening and said metal wiring located at the bottom of said first opening form a concave, and the part of said metal wiring of the other flexible wiring board piece to be bonded to said concave forms a convex on said base film.

12. (Amended) A multilayer flexible wiring board formed by laminating at least two flexible wiring board pieces having a base film and a metal wiring provided on said base film, wherein said base film of at least one flexible wiring board piece has a second opening in which said metal wiring exists at the bottom so that said metal wirings are electrically bonded to each other by applying ultrasonic wave while said metal wiring of the other flexible wiring board piece is in close contact with said metal wiring located at the bottom of said second opening, said second opening and said metal wiring located at the bottom of the second opening form a concave, and the part of the metal wiring of the other wiring board piece to be bonded to said concave forms a convex.